WHAT IS CLAIMED IS:

1. A process of separating a sample comprising:

attaching a different receptor agent to at least two distinct populations of magnetic microspheres with a specific range of magnetic moments;

combining a target sample with said distinct populations of magnetic microspheres containing the different attached receptor agents together for a period of time sufficient to allow for binding between attached receptor agents and target species within said target sample to form one or more receptor agent-target species complexes; and,

sorting said distinct populations of magnetic microspheres containing the different receptor agent-target species complexes by passage through a magnetic separator.

2. The process of claim 1 further including analyzing, for formation of one or more receptor agent-target species complexes within said target sample, each of said re-sorted distinct populations of magnetic microspheres containing the different attached receptor agents.

3. The process of claim 1 wherein said distinct populations of magnetic microspheres with a specific range of magnetic moments are obtained from a process comprising forming magnetic microspheres including magnetic particles, said magnetic microspheres adapted for attachment to a receptor agent; and sorting said magnetic microspheres by passage through a magnetic separator so as to separate said magnetic microspheres into a number of distinct populations of magnetic microspheres, each distinct population with a specific range of magnetic moments.

4. The process of claim 3 further including, prior to an initial sorting stage, passing said magnetic microspheres through a magnetic field so as to magnetize said magnetic microspheres.

5. The process of claim 1 wherein said magnetic microspheres are of a size of from about 0.01 micron to about 1000 microns.

6. The process of claim 1 wherein said magnetic microspheres are of substantially the same dimensions.

7. The process of claim 1 wherein said magnetic microspheres include magnetic particles of a material selected from the group consisting of a ferromagnetic material and a superparamagnetic material.

8. The process of claim 6 wherein said magnetic particles are selected from the group consisting of iron-cobalt, iron-platinum, and samarium-cobalt.

9. The process of claim 7 wherein said magnetic microspheres include magnetic particles and a coating material of a material selected from the group consisting of an organic polymeric material and glass.

10. The process of claim 7 wherein said magnetic microspheres include magnetic particles and a coating material of polystyrene.

11. The process of claim 1 wherein said receptor agents are selected from the group consisting of antigens, antibodies, peptides, proteins, nucleic acids, lipids, carbohydrates and enzymes.

12. The process of claim 1 wherein said forming magnetic microspheres including magnetic particles comprises coating said magnetic particles with a coating material selected from the group consisting of an organic polymeric material and glass.

13. The process of claim 1 wherein said forming magnetic microspheres including magnetic particles comprises imbedding said magnetic particles within a material selected from the group consisting of an organic polymeric material and glass.

14. The process of claim 1 wherein said forming magnetic microspheres including magnetic particles comprises immobilizing said magnetic particles on a surface of or within a material selected from the group consisting of an organic polymeric material and glass.

15. The process of claim 1 wherein said forming magnetic microspheres including magnetic particles comprises:

coating said magnetic particles with a material having a first reactive functionality; and,

reacting said coated magnetic particles with non-magnetic microspheres having a second reactive functionality, said second reactive functionality adapted for reaction with said first reactive functionality.

16.   The process of claim 15 wherein said first reactive functionality is selected from the group consisting of amines, carboxylates, epoxies and one of an affinity pair, and said second reactive functionality is different from said first reactive functionality and is selected from the group consisting of amines, carboxylates, epoxies, and the other of the affinity pair.

17.   The process of analyzing a sample comprising:

attaching a different receptor agent to at least two distinct populations of magnetic microspheres with a specific range of magnetic moments;

combining a target sample with said distinct populations of magnetic microspheres containing the different attached receptor agents for a period of time sufficient to allow for binding between attached receptor agents and target species within said target sample to form one or more receptor agent-target species complexes;

individually passing said magnetic microspheres in a fluid microsphere suspension into a flow channel and past a magnetic measurement system capable of measuring the magnetic moment of each individual magnetic microsphere so as to identify to which distinct population each suspended magnetic microsphere belongs; and,

analyzing individual magnetic microspheres in a detection system for detectable properties of receptor agent-target species complexes so as to measure a detectable property of each receptor agent-target species complex.

18.   The process of claim 17 wherein said distinct populations of magnetic microspheres with a specific range of magnetic moments are obtained from a process comprising forming magnetic microspheres including magnetic particles, said magnetic microspheres adapted for attachment to a receptor agent; and sorting said magnetic microspheres by passage through a magnetic separator so as to separate said magnetic microspheres into a number of distinct populations of magnetic microspheres, each distinct population with a specific range of magnetic moments.

19. The process of claim 17 further including, prior to an initial sorting stage, passing said magnetic microspheres through a magnetic field so as to magnetize said magnetic microspheres.

20. The process of claim 18 further including, after an initial sorting stage and prior to combining a target sample with the number of distinct populations of magnetized, magnetic microspheres containing the different attached receptor agents, demagnetizing said magnetized, magnetic microspheres.

21. The process of claim 20 further including passing said magnetic microspheres containing the different attached receptor agents in said flow channel through a magnetic field so as to re-magnetize said magnetic microspheres.

22. The process of claim 21 wherein said magnetic microspheres containing the different attached receptor agents further pass through an alignment field so as to orient said magnetic microspheres in a predetermined direction within said fluid microsphere suspension.

23. The process of claim 17 wherein said magnetic measurement system comprises one or more magnetic field sensors.

24. The process of claim 17 wherein said magnetic microspheres are of a size of from about 0.01 micron to about 1000 microns.

25. The process of claim 17 wherein said magnetic microspheres are of substantially the same dimensions.

26. The process of claim 17 wherein said magnetic microspheres include magnetic particles of a material selected from the group consisting of a ferromagnetic material and a superparamagnetic material.

27. The process of claim 26 wherein said magnetic particles are selected from the group consisting of iron-cobalt, iron-platinum, and samarium-cobalt.

28. The process of claim 26 wherein said magnetic microspheres include magnetic particles and a coating material of a material selected from the group consisting of an organic polymeric material and glass.

29. The process of claim 26 wherein said magnetic microspheres include magnetic particles and a coating material of polystyrene.

30. The process of claim 17 wherein said one or more magnetic field sensors are SQUID sensors.

31. The process of claim 17 wherein said detection system is a flow cytometry system.

32. The process of claim 31 wherein said flow cytometry detection system employs a laser detection system.

33. The process of claim 17 wherein said receptor agents are selected from the group consisting of antigens, antibodies, peptides, proteins, nucleic acids, lipids, carbohydrates and enzymes.

34. The process of claim 17 wherein said forming magnetic microspheres including magnetic particles comprises coating said magnetic particles with a coating material selected from the group consisting of an organic polymeric material and glass.

35. The process of claim 17 wherein said forming magnetic microspheres including magnetic particles comprises imbedding said magnetic particles within a material selected from the group consisting of an organic polymeric material and glass.

36. The process of claim 17 wherein said forming magnetic microspheres including magnetic particles comprises immobilizing said magnetic particles on a surface of or within a material selected from the group consisting of an organic polymeric material and glass.

37. The process of claim 17 wherein said forming magnetic microspheres including magnetic particles comprises:

coating said magnetic particles with a material having a first reactive functionality; and,

reacting said coated magnetic particles with non-magnetic microspheres having a second reactive functionality, said second reactive functionality adapted for reaction with said first reactive functionality.

38. The process of claim 37 wherein said first reactive functionality is selected from the group consisting of amines, carboxylates, epoxies and one of an affinity pair, and said second reactive functionality is different from said first reactive functionality and is selected from the group consisting of amines, carboxylates, epoxies, and the other of the affinity pair.

39.   The process of collecting a sample comprising:

attaching a different receptor agent to at least two distinct populations of magnetic microspheres with a specific range of magnetic moments;

combining a target sample with said distinct populations of magnetic microspheres containing the different attached receptor agents for a period of time sufficient to allow for binding between attached receptor agents and a target species within said target sample to form one or more receptor agent-target species complexes;

individually passing said magnetic microspheres in a fluid microsphere suspension into a flow channel and past a magnetic measurement system capable of measuring the magnetic moment of each individual magnetic microsphere so as to identify to which distinct population each suspended magnetic microsphere belongs; and,

collecting individual magnetic microspheres of at least one distinct population of magnetic microspheres.

40.   The process of claim 39 wherein said distinct populations of magnetic microspheres with a specific range of magnetic moments are obtained from a process comprising forming magnetic microspheres including magnetic particles, said magnetic microspheres adapted for attachment to a receptor agent; and sorting said magnetic microspheres by passage through a magnetic separator so as to separate said magnetic microspheres into a number of distinct populations of magnetic microspheres, each distinct population with a specific range of magnetic moments.

41.   The process of claim 40 further including, prior to an initial sorting stage, passing said magnetic microspheres through a magnetic field so as to magnetize said magnetic microspheres.

42.   The process of claim 41 further including, after an initial sorting stage and prior to combining a target sample with the number of distinct populations of magnetized, magnetic microspheres containing the different attached receptor agents, demagnetizing said magnetized, magnetic microspheres.

43.   The process of claim 42 further including passing said magnetic microspheres containing the different attached receptor agents in said a flow channel through a magnetic field so as to re-magnetize said magnetic microspheres.

44.   The process of claim 43 wherein said magnetic microspheres containing the different attached receptor agents further pass through an alignment field so as to orient said magnetic microspheres in a predetermined direction within said fluid microsphere suspension.

45.   The process of claim 39 wherein said magnetic measurement system comprises one or more magnetic field sensors.

46.   The process of claim 39 wherein said magnetic microspheres are of a size of from about 0.01 micron to about 1000 microns.

47.   The process of claim 39 wherein said magnetic microspheres are of substantially the same dimensions.

48.   The process of claim 39 wherein said magnetic microspheres include magnetic particles of a material selected from the group consisting of a ferromagnetic material and a superparamagnetic material.

49.   The process of claim 48 wherein said magnetic particles are selected from the group consisting of iron-cobalt, iron-platinum, and samarium-cobalt.

50.   The process of claim 48 wherein said magnetic microspheres include magnetic particles and a coating material of a material selected from the group consisting of an organic polymeric material and glass.

51.   The process of claim 48 wherein said magnetic microspheres include magnetic particles and a coating material of polystyrene.

52.   The process of claim 39 wherein said one or more magnetic field sensors are SQUID sensors.

53.   The process of claim 39 wherein said detection system is a flow cytometry system.

54.   The process of claim 33 wherein said flow cytometry detection system employs a laser detection system.

55.   The process of claim 39 wherein said receptor agents are selected from the group consisting of antigens, antibodies, peptides, proteins, nucleic acids, lipids, carbohydrates and enzymes.

56. The process of claim 39 wherein said forming magnetic microspheres including magnetic particles comprises coating said magnetic particles with a coating material selected from the group consisting of an organic polymeric material and glass.

57. The process of claim 39 wherein said forming magnetic microspheres including magnetic particles comprises imbedding said magnetic particles within a material selected from the group consisting of an organic polymeric material and glass.

58. The process of claim 39 wherein said forming magnetic microspheres including magnetic particles comprises immobilizing said magnetic particles on a surface of or within a material selected from the group consisting of an organic polymeric material and glass.

59. The process of claim 39 wherein said forming magnetic microspheres including magnetic particles comprises:

coating said magnetic particles with a material having a first reactive functionality; and,

reacting said coated magnetic particles with non-magnetic microspheres having a second reactive functionality, said second reactive functionality adapted for reaction with said first reactive functionality.

60. The process of claim 58 wherein said first reactive functionality is selected from the group consisting of amines, carboxylates, epoxies and one of an affinity pair, and said second reactive functionality is different from said first reactive functionality and is selected from the group consisting of amines, carboxylates, epoxies, and the other of the affinity pair.

61. A process of detecting multiple analytes in a sample comprising:

exposing a pooled population of subsets of magnetic microspheres to a sample, the magnetic microspheres in each subset having (i) a magnetic characteristic classification parameter that distinguishes the magnetic microspheres of one subset from those of another subset according to a predetermined magnetic measurement and (ii) a reactant specific for an analyte of interest;

passing the exposed pooled population of subsets of magnetic microspheres through an examination zone; and,

determining the identity and quantity of each analyte of interest in the sample by

10   substantially contemporaneously (i) collecting data relating to the magnetic characteristic

classification parameter, (ii) collecting data relating to the presence or absence of a

complex formed between the reactant and an analyte of interest specific to the reactant,

(iii) classifying each magnetic microsphere to its subset according to its predetermined

magnetic measurement, and (iv) quantifying the amount of complex associated with each

15   subset.

62.   The process of claim 61 wherein at least one analyte of interest is selected

from the group consisting of antigens, antibodies, peptides, proteins, nucleic acids, lipids,

carbohydrates and enzymes.

63.   The process of claim 61 wherein results of said process are displayed in real

time.